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Technical Memorandum

To: Kevin Parrett, Project Manager (DEQ) -- McCormick and Baxter Superfund Site

Date: July 13, 2004

From: John Montgomery, Project Manager (E & E)

Subject: June 1, 2004 through June 31, 2004 Barrier Wall Performance Monitoring Monthly Report

1.0 Introduction

This technical memorandum presents a monthly status report on groundwater movement and nonaqueous phase liquid (NAPL) thickness results inside and outside the barrier wall at the McCormick and Baxter Creosoting Company, Portland Plant (McCormick and Baxter) site in Portland, Oregon. The technical memorandum presents hydraulic head measurements and gradients, groundwater contour maps, transducer plots, NAPL gauging and extraction results. The monitoring data was collected during the period from June1, 2004 through June 31, 2004. Figures, tables and transducer plots are attached at the end of this technical memorandum.

The monitoring system at the McCormick and Baxter site is used to evaluate the functional performance of the containment system (the barrier wall) and to determine whether the containment system is performing the designed function. The purpose of this report is to provide data in support of the objectives and goals as defined in the monitoring plan. These include:

- Understand changes in groundwater flow outside and inside the barrier containment system;

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- Understand changes in gradients/fluxes from the bluff to the river on the north and south sides of the containment system;

- Understand groundwater flow and contaminant movement along the riverfront downgradient of the containment system;

- Determine the effects of groundwater flow toward Willamette Cove in relation to existing NAPL seeps; and

- Determine the effects of river stage and tidal influence on groundwater levels and flow.

2.0 Water-Level Monitoring

Automated and Manual Water-Level Data Collection

Groundwater level data is currently being collected at the site from select monitoring wells using automated pressure transducers and manually operated electronic water-level indicators.

Approximately 109 monitoring wells were manually monitored during the reporting period to determine groundwater elevations and calculate gradients inside and outside the barrier wall. Twenty-four select monitoring wells are equipped with pressure transducers to collect water-level measurements at hourly intervals (Table 1). The pressure transducers are equipped with internal batteries to allow for in-situ placement in the well. Data is currently downloaded at monthly intervals from each transducer location using a hand-held personal digital assistant or PDA.

On June 4, 2004 and June 21, 2004, groundwater-level data were collected manually from all on-site wells at low tide. Gauging began approximately 1 hour before low tide and was completed within 1 hour after low tide (e.g. during the tidal period that has the minimal water level change) to evaluate the influence of tides on site-wide groundwater conditions. E & E intends to incorporate this procedure for measuring water levels at low tide on a monthly basis. The resultant data will be used to construct a groundwater contour map for the Monthly Barrier Wall Performance Monitoring Reports. This procedure is expected to provide a more accurate assessment of groundwater flow at the site.

The monitoring wells designated with an *s* (e.g., MW-36s) are wells screened in the shallow zone. Those wells designated with an *i* (e.g., MW-36i) are screened in the intermediate zone, and those wells designated with a *d* (e.g., MW-36d) are screened in the deep zone. All deep zone monitoring wells were screened beneath the total barrier wall depth in that location. Figure 1 shows the locations of the monitoring well network.

River stage data is recorded daily from the Morrison Bridge and corrected to river stage adjacent to the McCormick and Baxter site.

2.1 Groundwater Flow and Gradients

Water levels recorded inside the wall have historically been higher relative to water levels outside the barrier wall in well clusters located along the riverfront. Figures 2a and 2b present groundwater contour maps representing conditions during low tide on June 21, 2004. Figures 3a and 3b present groundwater contour maps representing conditions during low tide on June 04, 2004. Groundwater inside the wall continues to generally flow toward the FWDA. The calculated horizontal gradient inside the wall for the current monitoring event is 0.003 ft/ft (from MW-50s to MW-36s). Horizontal gradients were calculated for several different areas on site inside and outside of the barrier wall and are listed in Table 2. Groundwater outside the wall is diverted around the upland portion of the wall toward Willamette Cove and toward the southeastern portion of the site. In the FWDA, heads inside the wall were approximately 3.92 feet higher than heads outside the wall. In the TFA, heads inside the wall were approximately 3.97 feet higher than heads outside the wall. Groundwater elevations on the inside of the wall remained fairly consistent with the previous reporting period. While groundwater elevations on the inside of the wall have remained fairly consistent, with the previous reporting period, river and groundwater elevations outside the wall have decreased due to seasonal precipitation declines. This has the net result of increasing the head difference from inside to outside the barrier wall without a rise in groundwater elevations within the wall.

Vertical groundwater gradients were calculated using data from June 21, 2004 for several of the nested wells installed inside and outside the barrier wall. Table 3 presents the calculated vertical gradients between the shallow, intermediate and deep aquifer zones during low tide. Vertical gradients are down inside and outside of the wall in both the FWDA (wells 36, 37, 40, 41) and the TFA (44 and 45).

2.2 Transducer Plots

Transducer plots were developed for select monitoring wells (MW-36s, MW-37s, MW-44s and MW-45s) inside and outside the barrier wall during the reporting period (Figures 4 and 5 respectively). The shallow aquifer plots compare monthly water-level elevations inside the barrier wall versus water-level elevations outside the barrier wall, river elevation, and precipitation data. Water levels outside the wall correlate well with river stage along the riverfront portion of the barrier wall. Water levels in shallow wells located inside the wall in the FWDA and the TFA appeared to be leveling off with no significant increase or decrease and although slightly higher in elevation, tend to mimic the river tidal behavior.

3.0 NAPL Thickness and Extraction

Light non-aqueous phase liquid (LNAPL) and dense non-aqueous liquid (DNAPL) measurements were recorded at several site wells during the reporting period. Currently, twenty-eight monitoring wells in the TFA and the FWDA are measured for NAPL thickness on a weekly basis. When LNAPL exceeding 0.4 ft thickness is encountered during routine monitoring, it is manually extracted using passive skimmers or bailers. When DNAPL exceeding 1.0 ft thickness is encountered during monitoring it

is extracted using pneumatic pumps. E & E is continuing to evaluate methods for extracting DNAPL of lesser thickness, but historically this has been problematic. Increased frequency of NAPL measurements and extraction during the monitoring period however, appear to have increased the overall removal volume. Table 4 presents LNAPL and DNAPL thickness measured during June 2004 and the amounts of NAPL extracted at each well following the measurement. Clean wells (wells not containing NAPL) are gauged on a monthly basis for water levels and total depths, and to verify that NAPL has not infiltrated these wells. Figures 2 and 3 show the locations of monitoring wells that have exhibited measurable thicknesses of LNAPL and/or DNAPL during June 2004.

LNAPL

The measured LNAPL thicknesses ranged from 0.01 feet to 3.23 feet in on site wells. Ten wells in the FWDA, six wells in the TFA, and one well near the shop exhibited measurable thicknesses of LNAPL during this reporting period (Table 4). Ten of these exhibited thicknesses of only 0.01. This is an increase in distribution from the previous reporting period.

LNAPL thicknesses measured in June 2004 were generally consistent with thicknesses measured in previous months.

DNAPL

Measurable DNAPL was recorded in eleven wells during the reporting period. The measured DNAPL thicknesses ranged from 0.02 feet to 10.10 feet in on site wells. Six wells in the FWDA, four wells in the TFA, and one well located near the shop building contained DNAPL during this reporting period (Table 4).

No significant difference in overall DNAPL thickness measurements was observed from May 2004 to June 2004.

The re-appearance of DNAPL may be attributable to the barrier wall construction activities, which involved operation of heavy equipment and subsurface vibrations along the barrier wall to a depth of 80 feet below ground surface. The resultant ground pressures and vibrations may have increased the ability of DNAPL to permeate site soils and enter nearby wells. In addition, the increased water-level elevations within the barrier wall may have remobilized some DNAPL (and LNAPL) previously retained in vadose soils. During "normal" site conditions, the high dynamic viscosity of DNAPL, combined with molecular attraction of the DNAPL fluid to soil particles, likely creates substantial resistance to the flow of DNAPL into wells. E & E will continue to carefully monitor the DNAPL levels in site wells to determine whether the recent DNAPL mobilization will continue, or whether the DNAPL thickness in the wells will gradually diminish.

NAPL Extraction

A total of 60.89 gallons of LNAPL was manually extracted during the reporting period using disposable bailers. A total of 116.67 gallons of DNAPL was extracted using pneumatic pumps during the reporting period. This is an increase of NAPL extraction

over the previous reporting period. During extraction, a certain percentage of groundwater is inadvertently removed as part of the extraction process. As a result, extraction volumes may not represent exact NAPL volumes. E & E is currently evaluating the percentage of water removed during NAPL extraction. The NAPL extraction values listed above are based on total gallons of fluid removed and have not been corrected for percentage of water. Slight increases in NAPL volume may also be related to further efficiency in DNAPL extraction, and more frequent NAPL extraction events. Table 4 lists the NAPL thickness and extracted values recorded for individual wells during this reporting period.

3.2 Seep Visual Inspection and Monitoring

Visual inspections of seep areas were conducted bi-weekly during the reporting period, including the existing seep areas in Willamette Cove and along the shoreline in front of the FWDA and TFA. During the bi-weekly visual inspections, the entire riverfront was checked for the presence of new seep areas, sheen observed on the surface water, and any other observations.

4.0 Summary Observations

Shallow aquifer water levels on the inside of the wall located in the TFA are typically higher than shallow water levels on the inside of the wall located in the FWDA. Flow is generally from the TFA to the FWDA. This is consistent with previous monitoring periods. Water level elevations within the barrier wall are consistent with the previous monitoring period with no substantial increase or decrease observed, indicating that the barrier wall is effectively preventing the flow of shallow groundwater.

Water levels will continue to be monitored and reported on a monthly basis. E&E is currently preparing a site groundwater flow model, which will be used as a tool for evaluating how local precipitation and Willamette River stage effect water levels within the barrier wall. The model will take into account such things as site geology, well screen intervals, horizontal and vertical flow, tidal effects, water budgets, and wall leakage.

NAPL monitoring and extraction will continue on a weekly basis, and patterns of NAPL appearance and rebound will be noted and used to optimize removal activities. Observed NAPL thicknesses and occurrence during the reporting period were fairly consistent with the previous reporting period. NAPL extraction volumes increased from the previous reporting period. This is likely due to increased frequency in NAPL monitoring and extraction.

Table 1
Monitoring Well Network
McCormick and Baxter Creosoting Company Site
Portland, Oregon

Well Identification	Monitoring Frequency	Measurement Method	Screen Interval (feet NGVD)
Existing Wells			
EW-1s	Weekly	Manual/NAPL Gauge	14.11 to -10.89
EW-2s	Weekly	Manual/NAPL Gauge	17.06 to -7.94
EW-4s	Weekly	Manual/NAPL Gauge	2.97 to -7.03
EW-5s	Weekly	Manual/NAPL Gauge	4.76 to -5.24
EW-7s	Weekly	Manual/NAPL Gauge	5.10 to -4.90
EW-8s	Weekly	Manual/NAPL Gauge	2.03 to -17.97
EW-9s	Weekly	Manual/NAPL Gauge	0.76 to -9.24
EW-10s	Weekly	Manual/NAPL Gauge	7.68 to -12.33
EW-12s	Weekly	Manual/NAPL Gauge	15.22 to -4.78
EW-14R	Weekly	Manual/NAPL Gauge	19.26 to -0.74
EW-15s	Weekly	Manual/NAPL Gauge	12.95 to -7.05
EW-16R	Weekly	Manual/NAPL Gauge	12.68 to -7.32
EW-17s	Weekly	Manual/NAPL Gauge	12.35 to -7.65
EW-18s	Weekly	Manual/NAPL Gauge	12.49 to -7.51
EW-19s	Weekly	Manual/NAPL Gauge	*9.64 to -9.5*
EW-20s	Weekly	Manual/NAPL Gauge	
EW-22s	Weekly	Manual/NAPL Gauge	18.51 to -1.50
EW-23s	Weekly	Manual/NAPL Gauge	15.19 to -4.82
EW-24s	Weekly	Manual/NAPL Gauge	22.21 to 2.21
EW-25s	Bi-Monthly	Manual/Water level indicator	20.90 to .90
MW-2s	Bi-Monthly	Manual/Water level indicator	17.47 to -2.53
MW-10s	Bi-Monthly	Manual/Water level indicator	16.87 to -3.13
MW-11s	Bi-Monthly	Manual/Water level indicator	16.46 tp -3.54
MW-14s	Bi-Monthly	Manual/Water level indicator	14.77 to -5.23
MW-15s	Bi-Monthly	Manual/Water level indicator	22.28 to 2.28
MW-17s	Bi-Monthly	Manual/Water level indicator	18.37 to -1.63
MW-18s	Bi-Monthly	Manual/Water level indicator	13.77 to -6.23
MW-20i	Weekly	Manual/NAPL Gauge	-16.29 to -36.29
MW-33s	Bi-Monthly	Manual/Water level indicator	13.49 to 3.49
MW-34i	Weekly	Manual/NAPL Gauge	-36.77 to -56.77
MW-36d	Hourly	Pressure Transducer	-55.2 to -60.20
MW-36i	Hourly	Pressure Transducer	-21.1141 to -26.11
MW-36s	Hourly	Pressure Transducer	13.75 to -1.25
MW-37d	Hourly	Pressure Transducer	-55.26 to -60.26
MW-37i	Hourly	Pressure Transducer	-20.17 to -25.17
MW-37s	Hourly	Pressure Transducer	9.01 to -7.99
MW-38s	Bi-Monthly	Manual/Water level indicator	13.11 to -1.89
MW-39s	Bi-Monthly	Manual/Water level indicator	12.15 to -2.85
MW-40d	Hourly	Pressure Transducer	-54.51 to -59.51
MW-40i	Hourly	Pressure Transducer	-20.42 to -25.42
MW-40s	Hourly	Pressure Transducer	13.61 to -1.39
MW-41d	Hourly	Pressure Transducer	-55.84 to -60.84
MW-41i	Hourly	Pressure Transducer	-21.80 to -26.80
MW-41s	Hourly	Pressure Transducer	12.44 to -2.56
MW-42s	Bi-Monthly	Manual/Water level indicator	17.40 to 2.40
MW-43s	Bi-Monthly	Manual/Water level indicator	16.12 to 1.12
MW-44d	Hourly	Pressure Transducer	-57.09 to -62.06
MW-44i	Hourly	Pressure Transducer	-16.81 to -21.81
MW-44s	Hourly	Pressure Transducer	11.11 to 1.11
MW-45d	Hourly	Pressure Transducer	-56.54 to -61.54
MW-45i	Hourly	Pressure Transducer	-20.51 to -25.51
MW-45s	Hourly	Pressure Transducer	11.95 to-3.05
MW-46s	Bi-Monthly	Manual/Water level indicator	15.88 to 0.88

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Table 1
Monitoring Well Network
McCormick and Baxter Creosoting Company Site
Portland, Oregon

Well Identification	Monitoring Frequency	Measurement Method	Screen Interval (feet NGVD)
MW-47s	Bi-Monthly	Manual/Water level indicator	16.48 to 1.48
MW-48s	Bi-Monthly	Manual/Water level indicator	14.60 to -0.40
MW-49s	Bi-Monthly	Manual/Water level indicator	13.91 to -1.09
MW-50s	Hourly	Pressure Transducer	15.87 to 0.87
MW-51s	Hourly	Pressure Transducer	16.46 to 1.46
MW-52s	Bi-Monthly	Manual/Water level indicator	16.85 to 1.85
MW-53s	Bi-Monthly	Manual/Water level indicator	11.62 to -3.38
MW-54s	Hourly	Pressure Transducer	12.43 to -2.57
MW-55s	Hourly	Pressure Transducer	17.26 to 2.26
MW-56s	Weekly	Manual/NAPL Gauge	24.42 to 14.42
MW-57s	Bi-Monthly	Manual/Water level indicator	24.36 to 14.36
MW-58d	Hourly	Pressure Transducer	-42.02 to -47.02
MW-58s	Hourly	Pressure Transducer	26.06 to 16.06
MW-5s	Bi-Monthly	Manual/Water level indicator	23.07 to 3.07
MW-7s	Bi-Monthly	Manual/Water level indicator	16.20 to -3.80
MW-7-WC	Bi-Monthly	Manual/Water level indicator	11.46 to -3.54
MW-As	Bi-Monthly	Manual/Water level indicator	12.80 to 7.80
MW-Bs	Bi-Monthly	Manual/Water level indicator	12.48 to 7.48
MW-Cs	Bi-Monthly	Manual/Water level indicator	16.04 to 11.04
MW-Ds	Weekly	Manual/NAPL Gauge	5.41 to 0.41
MW-Es	Weekly	Manual/NAPL Gauge	17.18 to -2.83
MW-Gs	Weekly	Manual/NAPL Gauge	13.73 to -6.27
MW-Is	Bi-Monthly	Manual/Water level indicator	18.39 to -1.61
MW-Ks	Bi-Monthly	Manual/Water level indicator	20.54 to 0.54
MW-LRs	Bi-Monthly	Manual/Water level indicator	17.83 to -2.07
MW-Ni	Weekly	Manual/NAPL Gauge	-22.53 to -33.53
MW-Os	Bi-Monthly	Manual/Water level indicator	15.39 to -4.62
MW-Ps	Bi-Monthly	Manual/Water level indicator	2.94 to -7.06
MW-Rs	Weekly	Manual/NAPL Gauge	16.66 to 1.66
MW-1s	June 21, 2004 event	Manual	8.5 to -11.5
MW-21s	June 21, 2004 event	Manual	3.32 to -6.68
MW-25s	June 21, 2004 event	Manual	1.12 to -8.88
MW-31s	June 21, 2004 event	Manual	0.58 to -9.42
MW-38i	June 21, 2004 event	Manual	-19.76 to -24.76
MW-38d	June 21, 2004 event	Manual	-54.75 to -59.75
MW-39i	June 21, 2004 event	Manual	-20.49 to -25.49
MW-39d	June 21, 2004 event	Manual	-55.22 to -60.22
MW-42i	June 21, 2004 event	Manual	-19.15 to -24.15
MW-42d	June 21, 2004 event	Manual	-54.63 to -59.63
MW-43i	June 21, 2004 event	Manual	-20.32 to -25.32
MW-43d	June 21, 2004 event	Manual	-55.4 to -60.40
MW-29s	June 21, 2004 event	Manual	0.62 to -10.62
MW-30s	June 21, 2004 event	Manual	-4.56 to -14.56
MW-26s	June 21, 2004 event	Manual	-2.13 to -12.13
MW-8i	June 21, 2004 event	Manual	-11.65 to -31.65
MW-27s	June 21, 2004 event	Manual	2.52 to -7.48
MW-28s	June 21, 2004 event	Manual	2.01 to -7.99
MW-3s	June 21, 2004 event	Manual	16.97 to -3.03
MW-58i	June 21, 2004 event	Manual	-12.14 to -17.14
MW-35s	June 21, 2004 event	Manual	9.74 to -10.26
MW-23d	June 21, 2004 event	Manual	- 141.55 to -151.55
MW-22i	June 21, 2004 event	Manual	-10.96 to -20.96
MW-Js	June 21, 2004 event	Manual	20.39 to 0.39
PW-2d	June 21, 2004 event	Manual	-38.62 to -58.62

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Table 1
Monitoring Well Network
McCormick and Baxter Creosoting Company Site
Portland, Oregon

Well Identification	Monitoring Frequency	Measurement Method	Screen Interval (feet NGVD)
PW-1d	June 21, 2004 event	Manual	-32.58 to -51.58
MW-32i	June 21, 2004 event	Manual	-14.79 to -24.79

Notes:
italic text = approximate value
All measurement taken during the June 4, 2004 event were taken manually

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Table 2

GROUNDWATER ELEVATION GRADIENTS
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

Well ID	Date	Horizontal Distance (ft)	Angle of Flowpath Deviation (degrees)	Horizontal Gradient (ft/ft)	Horizontal Gradient (ft/mile)
Inside Barrier Wall					
MW-50s to MW-36s	6/24/2004 (Low Tide)	1090.4	16	0.003	14.2
MW-50s to MW-36s	6/4/2004 (Low Tide)	1090.4	9	0.002	10.8
MW-48s to EW-16s[1]	6/24/2004 (Low Tide)	1218.7	8	0.003	14.9
MW-48s to EW-16s	6/4/2004 (Low Tide)	1218.7	5	0.003	17.8
TFA Monitoring Wells					
MW-48s to MW-44s	6/24/2004 (Low Tide)	558.2	13	0.001	6.0
MW-48s to MW-44s	6/4/2004 (Low Tide)	558.2	10	0.001	5.8
MW-48s to EW-4s	6/24/2004 (Low Tide)	456.0	14	0.006	31.9
MW-48s to EW-4s	6/4/2004 (Low Tide)	456.0	10	0.009	45.9
FWDA Monitoring Wells					
MW-15s to MW-36s	6/24/2004 (Low Tide)	400.4	13	0.003	13.9
MW-15s to MW-36s	6/4/2004 (Low Tide)	400.4	4	0.004	22.5
Outside Barrier Wall					
MW-45s to River[2]	6/24/2004 (Low Tide)	76.0		0.030	157.0
MW-45s to River[3]	6/4/2004 (Low Tide)	50.4		0.024	125.7
TFA Monitoring Wells					
MW-49s to MW-47s	6/24/2004 (Low Tide)	387.5	30	0.020	104.2
MW-49s to MW-47s	6/4/2004 (Low Tide)	387.5	42	0.017	88.0
FWDA Monitoring Wells					
MW-57s to MW-58s	6/24/2004 (Low Tide)	30.0	36	0.037	196.0
MW-57s to MW-58s	6/4/2004 (Low Tide)	30.0	40	0.026	138.0

Note:

[1] EW-16s contains LNAPL. The difference in depth from the LNAPL to the static water level is no greater than 0.01 feet, which is the level of error attributed to the measuring instrument. Due to the small difference, it is assumed that the water level is not strongly affected by the LNAPL, and that the water level in the wells is very close to the water table surrounding the wells. For this reason no additional adjustments have been made.

[2] The distance from the Willamette River to the well is the corresponding ground surface elevation for the river stage at low tide (4.57 NGVD), perpendicular from MW-45s to the river.

[3] The distance from the Willamette River to the well is the corresponding ground surface elevation for the river stage at low tide (7.9 NGVD), perpendicular from MW-45s to the river.

Key:

ft = Feet.
ft/ft = Feet per foot.
ft/mile = Feet per mile.
FWDA = Former waste disposal area.
MSL = Mean sea level.
TFA = Tank farm area.

Table 3
VERTICAL GROUNDWATER ELEVATION GRADIENTS
June 21, 2004
McCORMICK & BAXTER CREOSOTING COMPANY
PORTLAND, OREGON

Well ID	Low Tide (1814) Mid-point value	Direction
MW-36s to MW-36d	0.06475	down
MW-36s to MW-36i	0.14000	down
MW-36i to MW-36d	0.00264	down
MW-37s to MW-37d	0.00517	down
MW-37s to MW-37i	0.01263	down
MW-37i to MW-37d	0.00029	down
MW-40s to MW-40d	0.08035	down
MW-40s to MW-40i	0.17280	down
MW-40i to MW-40d	0.00469	down
MW-41s to MW-41d	0.006784	down
MW-41s to MW-41i	1.250E-02	down
MW-41i to MW-41d	0.00235	down
MW-44s to MW-44d	0.10070	down
MW-44s to MW-44i	0.20860	down
MW-44i to MW-44d	0.013470	down
MW-45s to MW-45d	0.00640	down
MW-45s to MW-45i	0.00803	down
MW-45i to MW-45d	0.0052750	down

Note: Gradients calculated using EPA vertical gradient calculator.
http://www.epa.gov/athens/learn2model/part-two/onsite/vgradient02.htm

Table 4
LNAPL and DNAPL Measurement Summary
June 1 through June 31, 2004
McCormick and Baxter Creosoting Company Site
Portland, OR

Date Measured	Well Number	Measured Thickness (feet)	Extracted (Gallons)
LNAPL			
06/01/04	EW-12s	0.01	0
06/01/04	EW-18s	1.12	1.5
06/01/04	EW-24s	0.01	0
06/01/04	MW-Rs	0.62	1
06/02/04	EW-15s	2.55	5
06/02/04	MW-56s	0.74	1
06/02/04	MW-Es	0.62	2
06/03/04	EW-10s	2.74	5
06/03/04	EW-23s	2.93	2.5
06/03/04	EW-19s	0.01	0
06/03/04	MW-Gs	0.11	0
06/08/04	EW-10s	1.04	3
06/08/04	EW-15s	3.23	5
06/08/04	EW-18s	1.53	2
06/08/04	EW-19s	0.01	0
06/08/04	EW-20s	0.01	0
06/08/04	EW-23s	2.60	2
06/08/04	EW-24s	0.01	0
06/08/04	MW-56s	1.69	0.75
06/08/04	MW-Es	1.01	1.5
06/08/04	MW-Gs	0.02	0
06/08/04	MW-Rs	0.55	0.5
06/14/04	EW-10s	1.82	3
06/14/04	EW-15s	2.04	4
06/14/04	EW-18s	1.50	3.5
06/14/04	EW-19s	0.01	0
06/14/04	EW-20s	0.01	0
06/14/04	EW-23s	1.81	2
06/14/04	EW-24s	0.01	0
06/14/04	EW-9s	0.01	0
06/14/04	MW-20i	0.01	0
06/14/04	MW-Ds	0.01	0
06/14/04	MW-Es	1.47	2.5
06/14/04	MW-Gs	0.01	0
06/14/04	MW-Rs	0.43	1
06/14/04	MW-56s	1.21	1
06/21/04	EW-12s	0.10	0
06/21/04	EW-18s	1.23	3.5
06/21/04	MW-Es	1.17	2
06/21/04	EW-15s	1.57	5
06/21/04	MW-Ds	0.01	0
06/22/04	EW-10s	0.76	-
06/22/04	MW-Gs	0.01	0
06/22/04	MW-20i	0.01	0
06/22/04	EW-20s	0.01	0
06/22/04	EW-23s	2.07	4
06/22/04	MW-56s	0.91	-
06/22/04	EW-8s	0.01	0

Note: Extraction values have not been corrected for percentage of water.

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Table 4
LNAPL and DNAPL Measurement Summary
June 1 through June 31, 2004
McCormick and Baxter Creosoting Company Site
Portland, OR

Date Measured	Well Number	Measured Thickness (feet)	Extracted (Gallons)
06/22/04	EW-18s	1.14	-
06/22/04	MW-Es	1.37	-
06/22/04	MW-Is	0.01	0
06/25/04	EW-10s	0.47	3
06/28/04	EW-12s	0.01	0
06/28/04	EW-15s	1.77	4.5
06/28/04	EW-18s	1.49	3
06/28/04	EW-23s	1.60	3
06/28/04	MW-56s	0.59	-
06/28/04	MW-Ds	0.01	0
06/28/04	MW-Es	0.43	1
06/28/04	MW-Rs	0.26	0
DNAPL			
06/01/04	EW-12s	2.60	2.5
06/01/04	MW-Is	1.63	3.5
06/01/04	EW-1s	2.30	8
06/01/04	EW-24s	1.31	3
06/01/04	EW-8s	2.84	4
06/02/04	EW-9s	1.17	3
06/02/04	MW-Ds	3.67	3.5
06/02/04	MW-Es	0.55	0
06/03/04	MW-20i	8.38	10
06/03/04	MW-Gs	2.13	3
06/08/04	EW-12s	2.83	3
06/08/04	EW-1s	2.08	7
06/08/04	EW-24s	0.90	0
06/08/04	EW-2s	0.02	0
06/08/04	EW-8s	2.58	4.5
06/08/04	EW-9s	1.18	2.5
06/08/04	MW-Is	1.71	3
06/08/04	MW-20i	9.51	11
06/08/04	MW-Ds	3.08	3
06/08/04	MW-Gs	1.05	2
06/14/04	EW-12s	3.34	6
06/14/04	EW-1s	1.04	7
06/14/04	EW-24s	1.02	4
06/14/04	EW-8s	2.48	6
06/14/04	EW-9s	1.37	3
06/14/04	MW-20i	10.10	10
06/14/04	MW-Ds	3.03	4
06/14/04	MW-Es	0.44	0
06/14/04	MW-Gs	1.41	3
06/14/04	MW-Is	1.07	2.5
06/21/04	EW-12s	3.19	3
06/21/04	MW-Is	0.91	2.5
06/21/04	EW-8s	1.64	4
06/21/04	MW-Ds	1.63	3
06/22/04	MW-Gs	0.61	0
06/22/04	EW-2s	1.86	-
06/22/04	MW-20i	7.34	10
06/28/04	EW-12s	2.47	-
06/28/04	EW-1s	1.50	5
06/28/04	EW-24s	0.73	0
06/28/04	EW-8s	1.95	4
06/28/04	EW-9s	0.43	0
06/28/04	MW-Ds	2.80	3.5
06/28/04	MW-Is	1.65	-

Note: Extraction values have not been corrected for percentage of water.

DRAFT

LEGEND

- WELL LOCATIONS
- BORE HOLE
- RAILROAD TRACKS
- PROPERTY LINE
- BARRIER WALL

SCALE IN FEET
0 100 200 300

Note: The BW locations are approximate.

NO.	DATE	DSN	APP'D	DESCRIPTION
				REVISIONS

ecology and environment, inc.
International Specialists in the Environment
Portland, Oregon

DESIGNED BY: C. NANCARROW
CHECKED BY:
DRAWN BY: E. YAO
APPROVED BY

FIGURE 1
MONITORING WELL LOCATIONS
McCORMICK AND BAXTER CREOSOTING COMPANY

SCALE	DATE ISSUED	C.A.D. FILE NO.	FIGURE NO.
NOTED	05-06-04	figure1.dwg	1

BRG PLOTTED: 05-06-04

LEGEND

- WELL LOCATION
- WELL DESIGNATED WITH MEASURABLE LNAPL
- WELL DESIGNATED WITH MEASURABLE DNAPL
- WELL DESIGNATED WITH DNAPL AND LNAPL
- RAILROAD TRACKS
- PROPERTY LINE
- BARRIER WALL
- SEEP LOCATION

Note: Static water levels taken between 5:30 PM and 7:30 PM.

Willamette river average elevation is 4.57 NGVD between 5:30 PM and 7:30 PM on 06-24-04.

The following wells that contain LNAPL are also included in the groundwater contour information on this map : MW-Gs, EW-2s, MW-Ds, EW-9s, EW-16s, MW-Rs and EW-5s. The difference in depth from the LNAPL to the static water level in these wells is no greater than 0.01 feet, which is the level of error attributed to the measuring instrument. Due to the small difference, it is assumed that the water level is not strongly affected by the LNAPL, and that the water level in the wells is very close to the water table surrounding the wells. For this reason no additional adjustments have been made.

SCALE IN FEET
0 150 300

NO.	DATE	BY/N	APP'D	DESCRIPTION

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CHECKED BY:

DRAWN BY: E. YAO

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Figure 2a

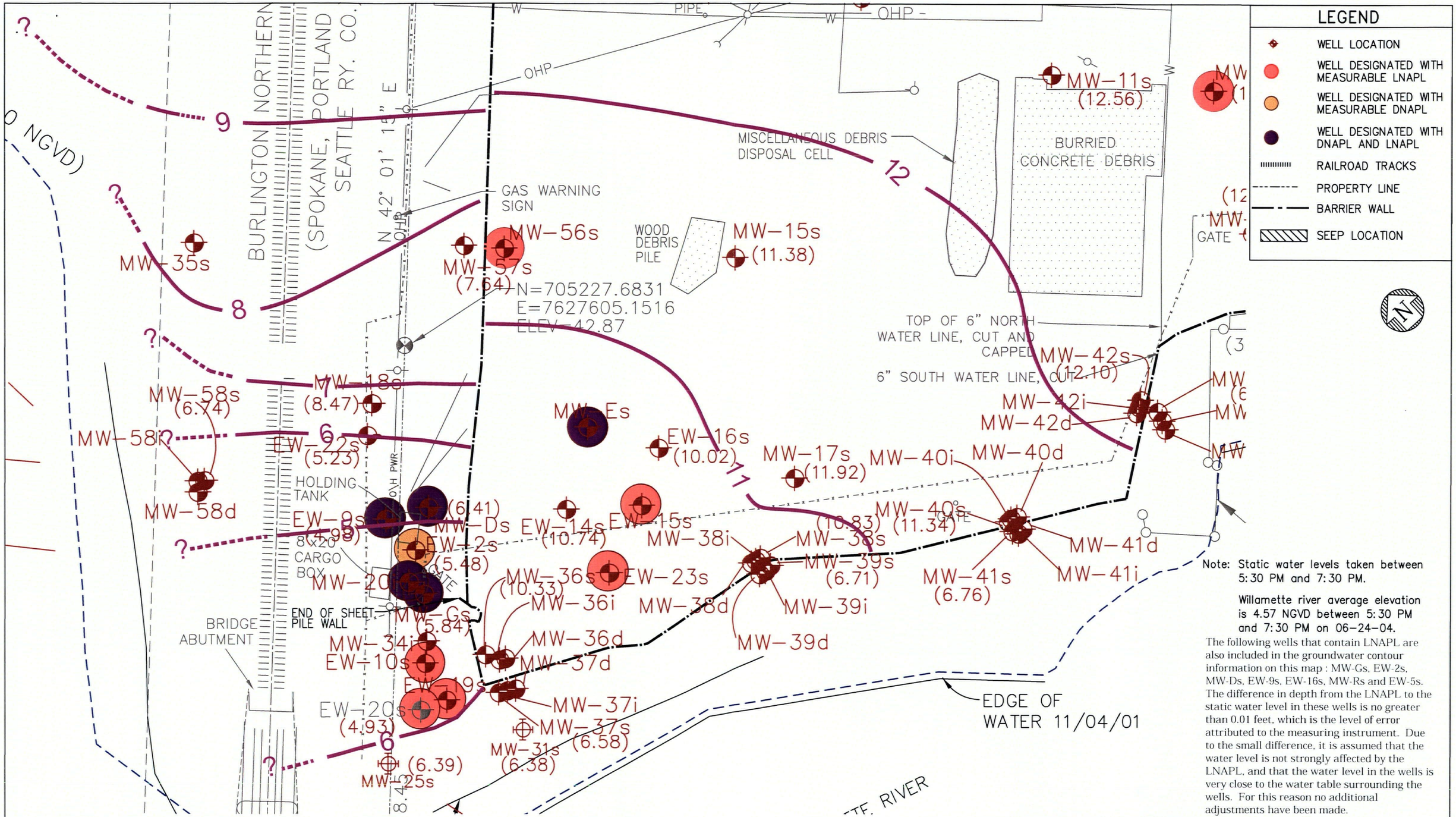
Monitoring Wells With NAPL Present and Groundwater Contours at Low Tide

McCORMICK AND BAXTER CREOSOTING COMPANY

June 24, 2004

SCALE	DATE ISSUED	C.A.D. FILE NO.	FIGURE NO.
NOTED	07-13-04	figure2a.dwg	1

BRG PLOTTED: 07-13-04



Note: Static water levels taken between 5:30 PM and 7:30 PM.

Willamette river average elevation is 4.57 NGVD between 5:30 PM and 7:30 PM on 06-24-04.

The following wells that contain LNAPL are also included in the groundwater contour information on this map : MW-Gs, EW-2s, MW-Ds, EW-9s, EW-16s, MW-Rs and EW-5s. The difference in depth from the LNAPL to the static water level in these wells is no greater than 0.01 feet, which is the level of error attributed to the measuring instrument. Due to the small difference, it is assumed that the water level is not strongly affected by the LNAPL, and that the water level in the wells is very close to the water table surrounding the wells. For this reason no additional adjustments have been made.

SCALE IN FEET
0 50 100

NO.	DATE	BY/N	APP'D	DESCRIPTION
				REVISIONS

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International Specialists in the Environment
Portland, Oregon

DESIGNED BY:
CHECKED BY:
DRAWN BY: E. YAO
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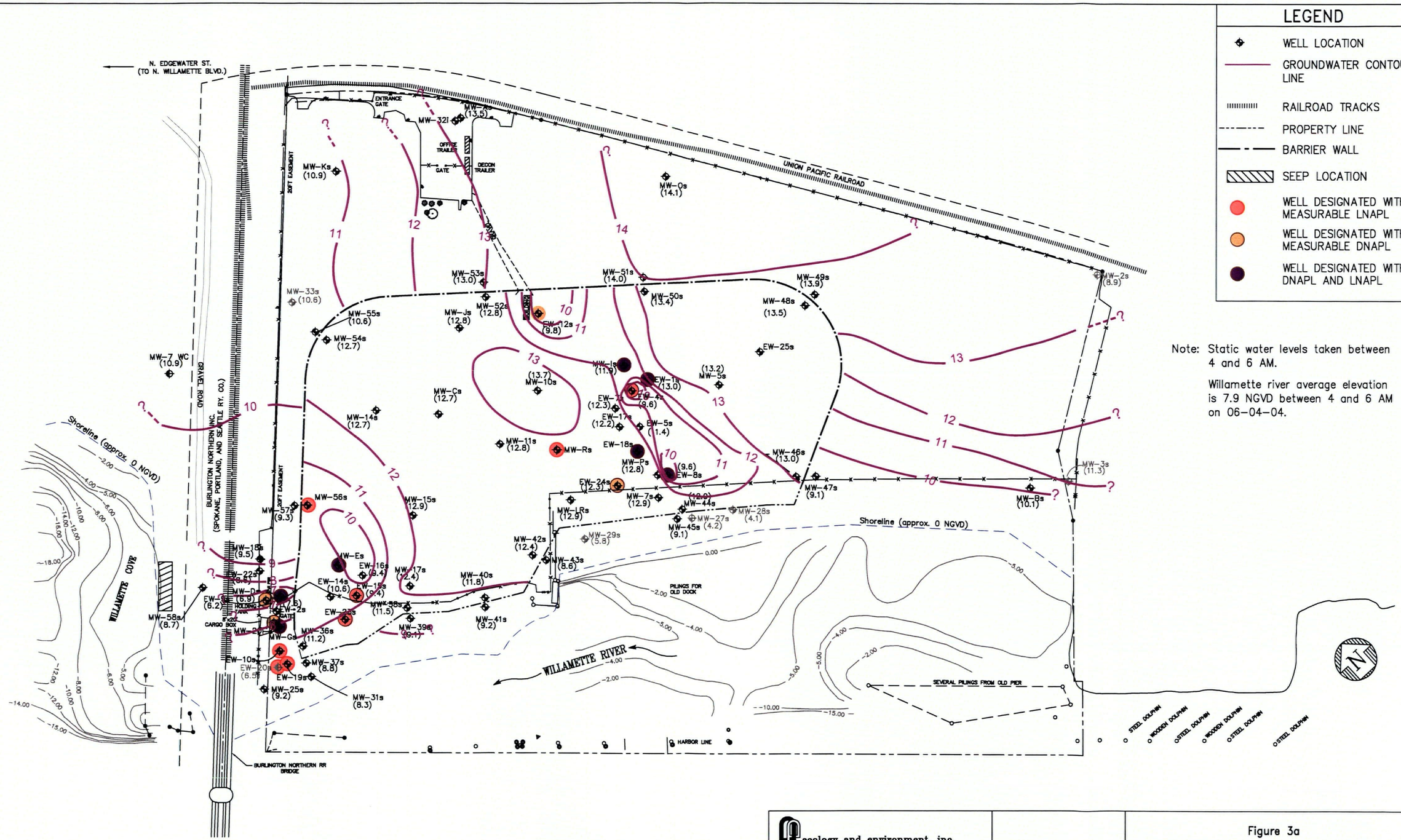
Figure 2b

Monitoring Wells With NAPL Present and Groundwater Contours at Low Tide
FWDA Area
McCORMICK AND BAXTER CREOSOTING COMPANY

June 24, 2004

SCALE	DATE ISSUED	CAD FILE NO.	FIGURE NO.
NOTED	07-13-04	figure2a.dwg	1

BRG PLOTTED: 07-13-04



LEGEND

- WELL LOCATION
- GROUNDWATER CONTOUR LINE
- RAILROAD TRACKS
- PROPERTY LINE
- BARRIER WALL
- SEEP LOCATION
- WELL DESIGNATED WITH MEASURABLE LNAPL
- WELL DESIGNATED WITH MEASURABLE DNAPL
- WELL DESIGNATED WITH DNAPL AND LNAPL

Note: Static water levels taken between 4 and 6 AM.

Willamette river average elevation is 7.9 NGVD between 4 and 6 AM on 06-04-04.

SCALE IN FEET
0 100 200 300

NO.	DATE	DRN	APP'D	DESCRIPTION
				REVISIONS

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International Specialists in the Environment
Portland, Oregon

DESIGNED BY: J. SPIEGEL

CHECKED BY: E. LYNCH

DRAWN BY: E. YAO

APPROVED BY

Figure 3a
Monitoring Wells with NAPL Present
and
Groundwater Contours at Low Tide

McCORMICK AND BAXTER CREOSOTING COMPANY

June 04, 2004

SCALE	DATE ISSUED	C.A.D. FILE NO.	FIGURE NO.
NOTED	06-21-04	figure3_low.dwg	1

BRG PLOTTED: 06-21-04

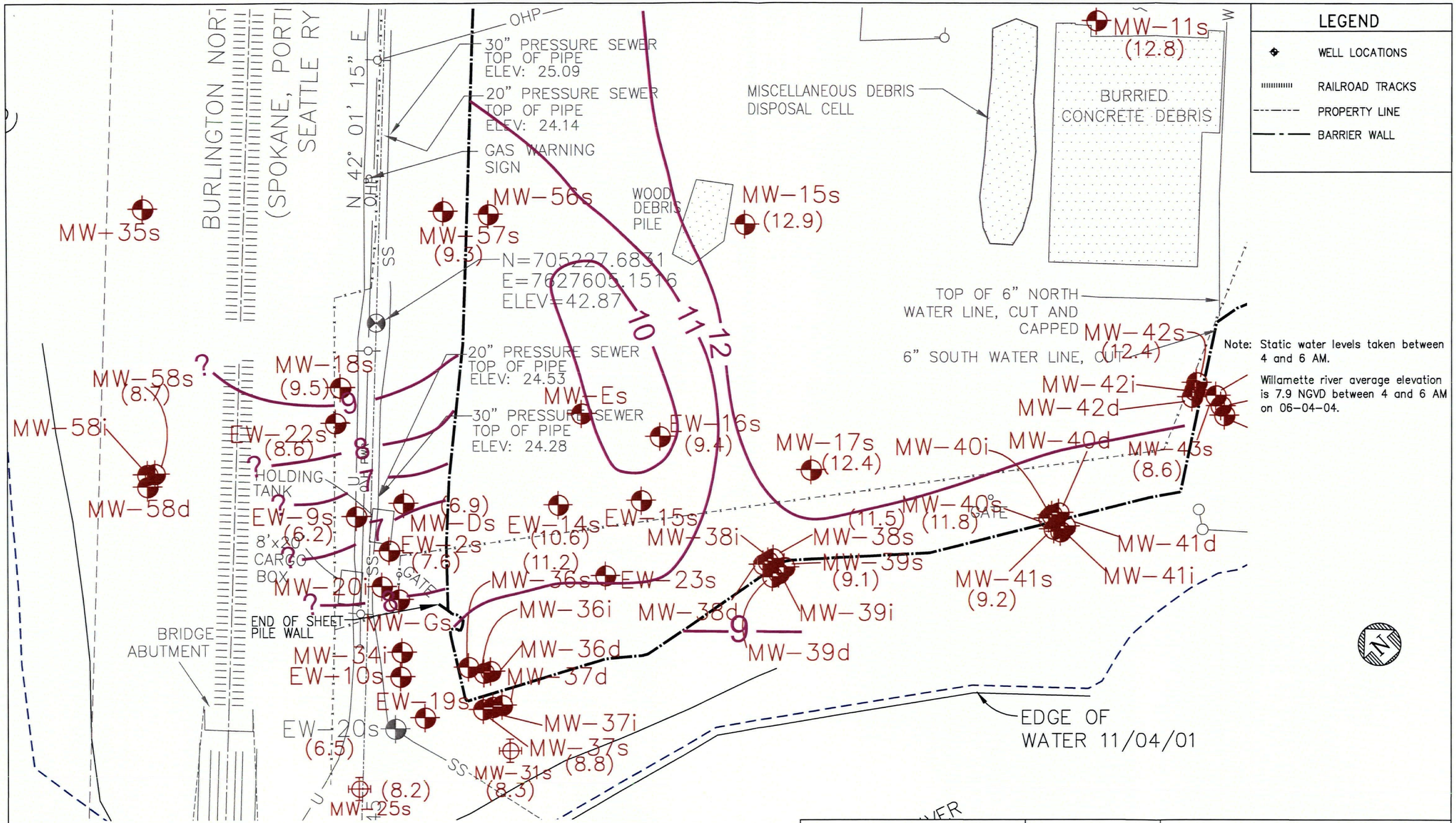
LEGEND
WELL LOCATIONS
RAILROAD TRACKS
PROPERTY LINE
BARRIER WALL
BURLINGTON NORTHERN SANTA FE RY
(SPOKANE, PORTLAND & SEATTLE RY
N 42° 01' 15" E
OHP
30" PRESSURE SEWER TOP OF PIPE ELEV: 25.09
20" PRESSURE SEWER TOP OF PIPE ELEV: 24.14
GAS WARNING SIGN
MW-56s
MW-57s (9.3)
N=705227.6831
E=7627605.1516
ELEV=42.87
MW-15s (12.9)
WOOD DEBRIS PILE
MISCELLANEOUS DEBRIS DISPOSAL CELL
MW-11s (12.8)
BURRIED CONCRETE DEBRIS
TOP OF 6" NORTH WATER LINE, CUT AND CAPPED
6" SOUTH WATER LINE, CUT
MW-42s (12.4)
MW-42i
MW-42d
MW-43s (8.6)
Note: Static water levels taken between 4 and 6 AM.
Willamette river average elevation is 7.9 NGVD between 4 and 6 AM on 06-04-04.
MW-35s
MW-58s (8.7)
MW-58i
MW-58d
MW-18s (9.5)
EW-22s (8.6)
HOLDING TANK
EW-9s (6.2)
8'x20' CARGO BOX
MW-20i
MW-Es
20" PRESSURE SEWER TOP OF PIPE ELEV: 24.53
30" PRESSURE SEWER TOP OF PIPE ELEV: 24.28
EW-16s (9.4)
MW-17s (12.4)
MW-40i
MW-40d
MW-40s (11.5)
(11.8)
GATE
MW-38i
MW-38s
MW-39s (9.1)
MW-39i
MW-39d
MW-41s (9.2)
MW-41d
MW-41i
MW-Ds (6.9)
EW-2s (7.6)
EW-14s (10.6)
(11.2)
EW-15s
MW-36s
EW-23s
MW-36i
MW-36d
MW-Gs
END OF SHEET PILE WALL
BRIDGE ABUTMENT
MW-34i
EW-10s
EW-19s
MW-37d
MW-37i
MW-37s (8.8)
EW-20s (6.5)
MW-31s (8.3)
(8.2)
MW-25s
10
11
12
9
EDGE OF WATER 11/04/01
N
SCALE IN FEET
0 50 100
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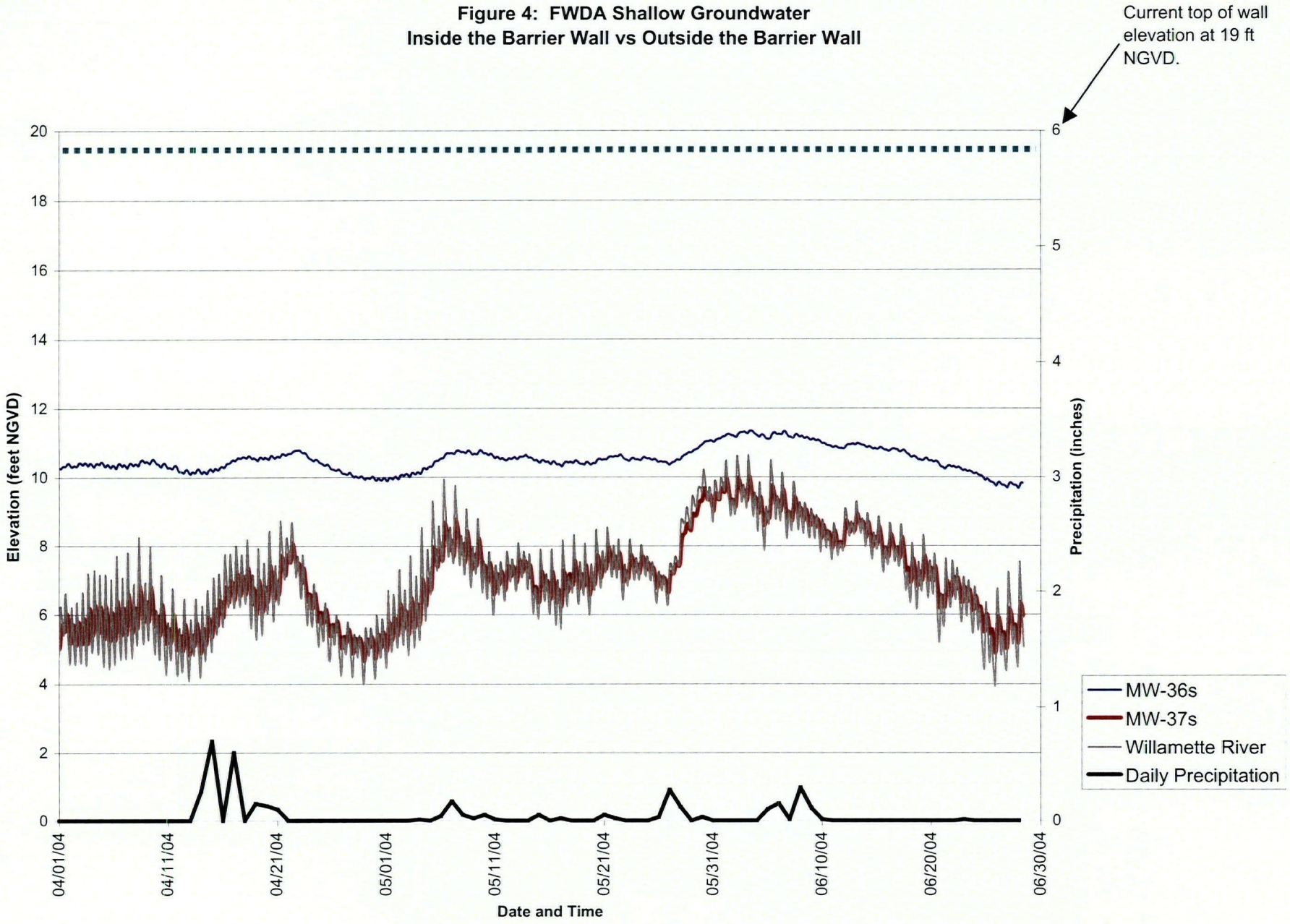
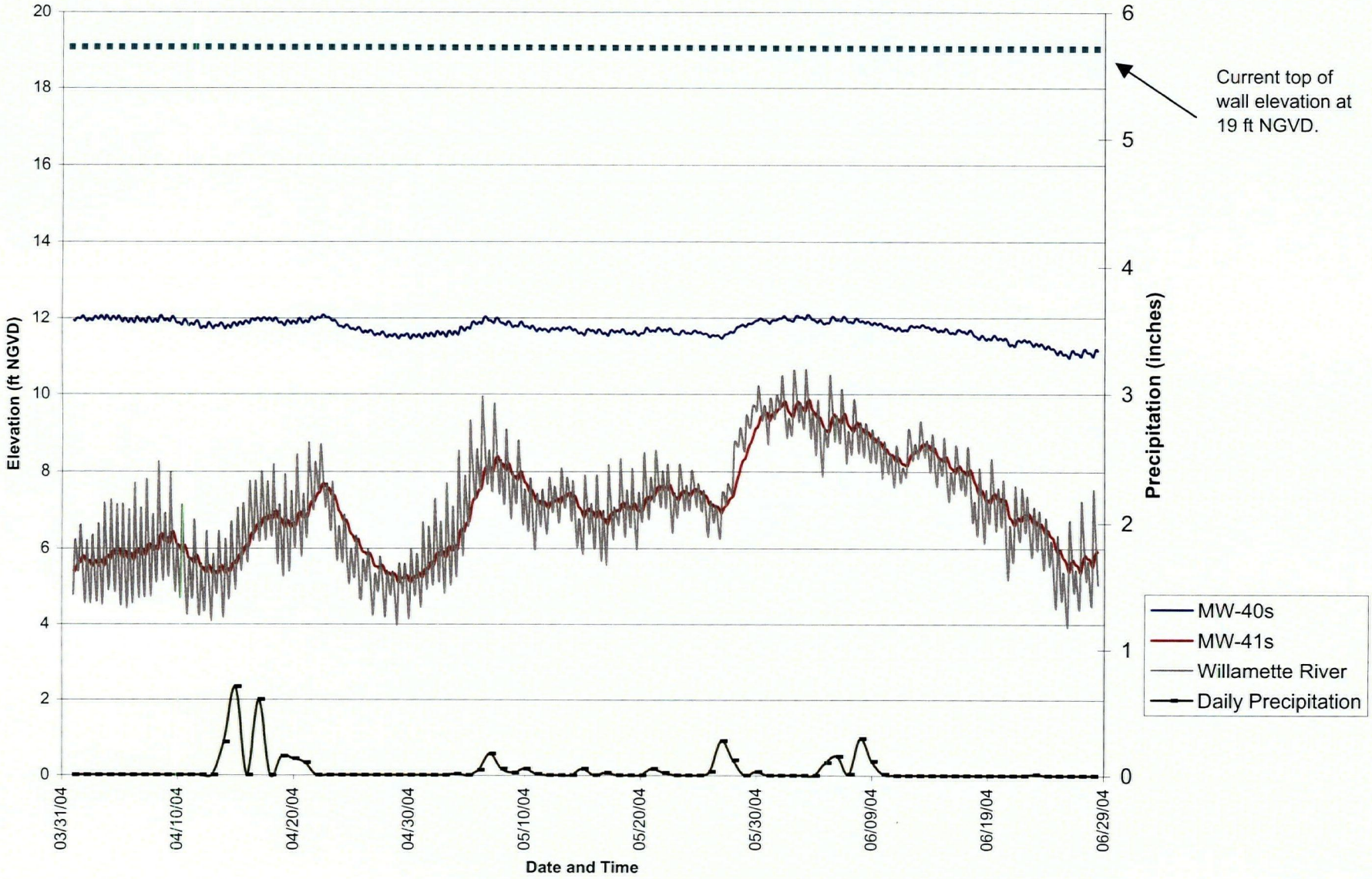
Figure 3b
Monitoring Wells FWDA Area
Groundwater Contours at Low Tide
McCORMICK AND BAXTER CREOSOTING COMPANY
June 04, 2004
SCALE: NOTED
DATE ISSUED: 06-21-04
CAD FILE NO.: figure3_low.dwg
FIGURE NO.: 1
BRG PLOTTED: 06-21-04

Figure 4: FWDA Shallow Groundwater
Inside the Barrier Wall vs Outside the Barrier Wall



*Note: Precipitation data presented in this graph is obtained from the City of Portland HYDRA Rainfall NEtwork, Swan Island raingage at http://oregon.usgs.gov/non-usgs/bes/

Figure 5: TFA Shallow Groundwater
Inside the Barrier Wall vs. Outside the Barrier Wall



*Note: Precipitation data presented in this graph is obtained from the City of Portland HYDRA Rainfall Network, Swan Island raingage, at http://oregon.usgs.gov/non-usgs/bes/